

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-072135

(43)Date of publication of application : 12.03.2002

(51)Int.Cl. G02B 27/22  
G03B 35/18  
G03B 35/20  
G03B 35/26  
G09F 9/00  
H04N 13/04

(21)Application number : 2000-261222 (71)Applicant : JAPAN SCIENCE &  
TECHNOLOGY CORP

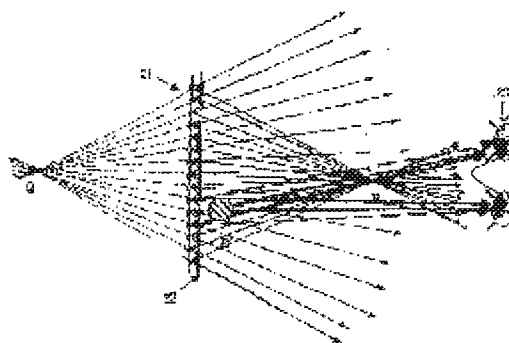
(22)Date of filing : 30.08.2000 (72)Inventor : KOBAYASHI TETSUO

(54) THREE-DIMENSIONAL IMAGE DISPLAYING SYSTEM WHICH SERVES BOTH AS  
REGENERATION OF RAY OF LIGHT AND MULTIEYE- PARALLAX OF SHADOW  
PICTURE-TYPE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a three-dimensional image displaying system serving both as a regeneration of ray of light and a multieye-parallax of shadow picture-type by which a three-dimensional stereoscopic image can be observed in series from the inner part to this side of a displaying element.

SOLUTION: A color filter 22 is arranged on the side of an observer 23 of a white point light source array 21, and the rays of the light from the white point light source are selected and colored by the color filter 22 in order to generate a number of groups of the rays of the light corresponding to the scattered light from each point of an object so that the observer 23 in an area distant from the color filter 22 and the white point light source can see the object as if it is really there. Regarding a point light source which cannot regenerate a sufficient number of the rays of the light and the adjacency of the color filter 22 with the above method, however, the rays of the light are selected and colored by the color filter 22 so that image information, which reaches the eyes from the white point light source via the color filter



22, can make an operation for a parallax-type stereoscopic displaying which depends on visual angles of upward and downward directions as well as right and left directions, and further these operations exist together and are serially connected in their meddle area.

---

## DESCRIPTION OF DRAWINGS

---

### [Brief Description of the Drawings]

[Drawing 1] It is a figure showing the basic principle of 2 eye type parallax stereogram.

[Drawing 2] It is a lineblock diagram of multi-view type parallax.

[Drawing 3] It is a basic constitution figure of the three-dimensional picture display system combining and [ of this invention / beam-of-light ], and shadow picture type multi-view parallax.

[Drawing 4] They are other lineblock diagrams of this invention.

[Drawing 5] They are other composition (lens working mold) of this invention.

[Drawing 6] It is a key map of the image reproduction near this invention.

[Drawing 7] It is a figure showing parallax stereoscopic model reproduction near the indicator in this invention.

[Drawing 8] It is a figure showing the example of the three-dimensional picture reproduced by this invention.

[Drawing 9] It is a figure showing the light filter in which the example of this invention is shown.

[Drawing 10] It is a principle figure of a corporal vision.

[Drawing 11] It is a figure showing the basic constitution of a beam-of-light reclaiming process.

[Drawing 12] It is a figure showing the problem of a beam-of-light playback system.

### [Description of Notations]

1 and 11 A screen or panel

2 Barrier which the slit opened

2a Slit

3, 13, 23, 36, 44, 55, and 64 Watcher

3a and 55a Right eye

3b and 55b Left eye

4 The picture for right eyes

5 The picture for left eyes

12 A slit array or a two-dimensional pinhole array

21 White point light source array

22, 35, 42, 53, and 63 Light filter

31 Tabular white light source

32 Scattered plate

33 Pinhole array

34, 41, 51, 61 white point light source arrays

37 The image reproduced by multi-view parallax

38 The stereoscopic model reproduced by beam-of-light reproduction

39 The reproduced beam of light

43 Lens

45 The reconstruction image at the time of using a lens

46 The reconstruction image when not using a lens

50 and 60 Indicator

52 and 62 White point light source

54 Each section of a filter

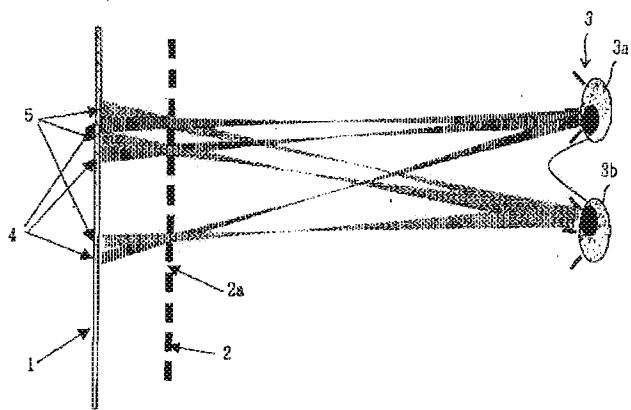
56 and 57 Object to reproduce

---

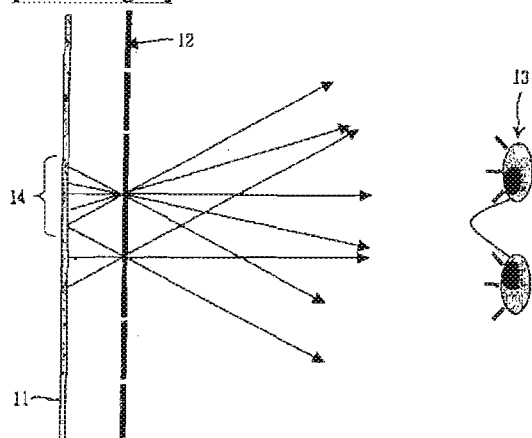
[Translation done.]

## DRAWINGS

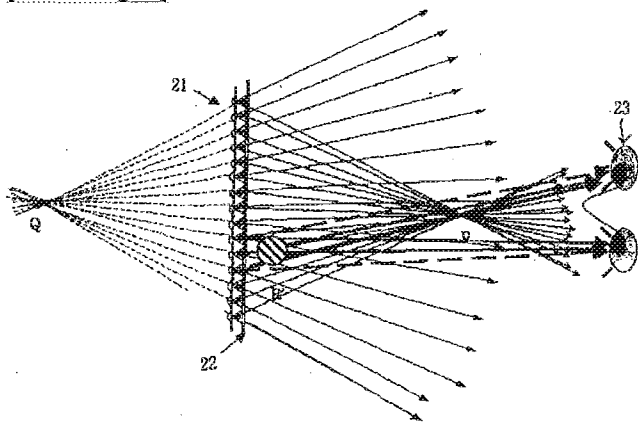
[Drawing 1]



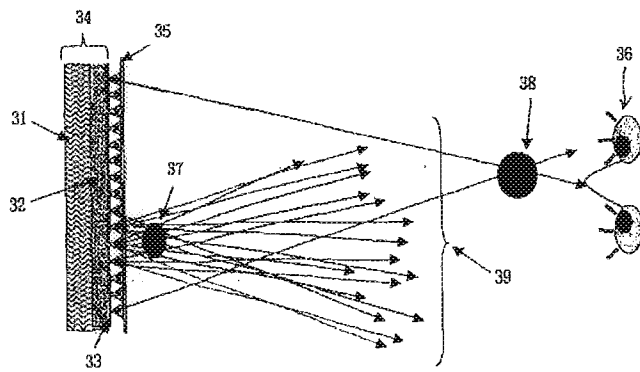
[Drawing 2]



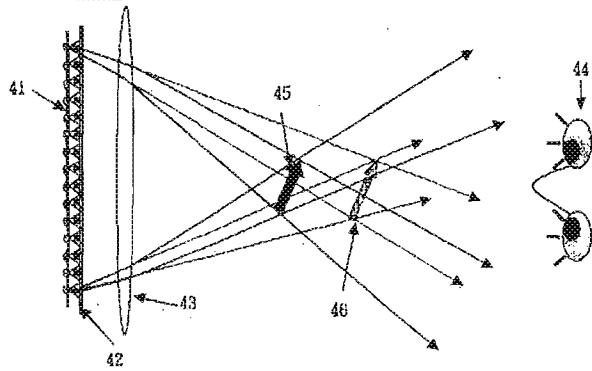
[Drawing 3]



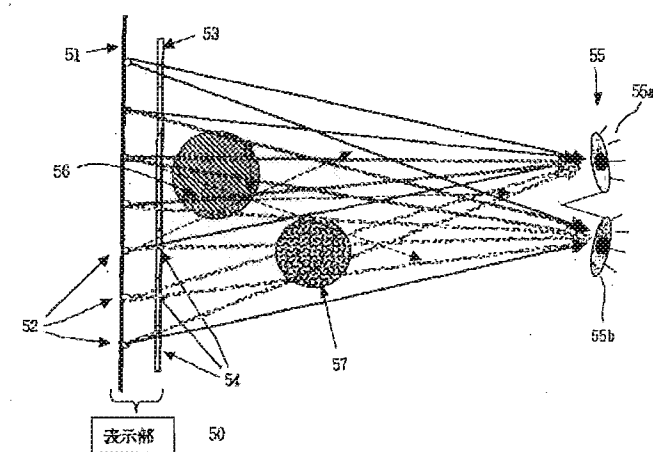
[Drawing 4]



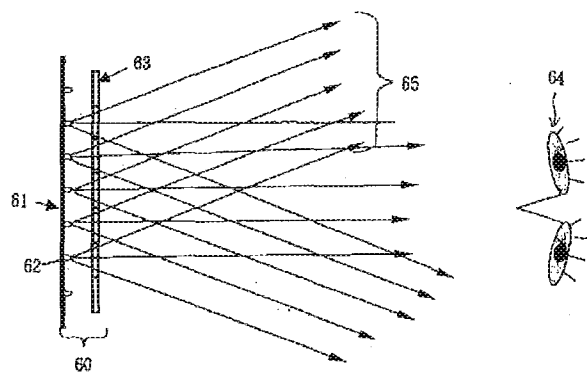
[Drawing 5]



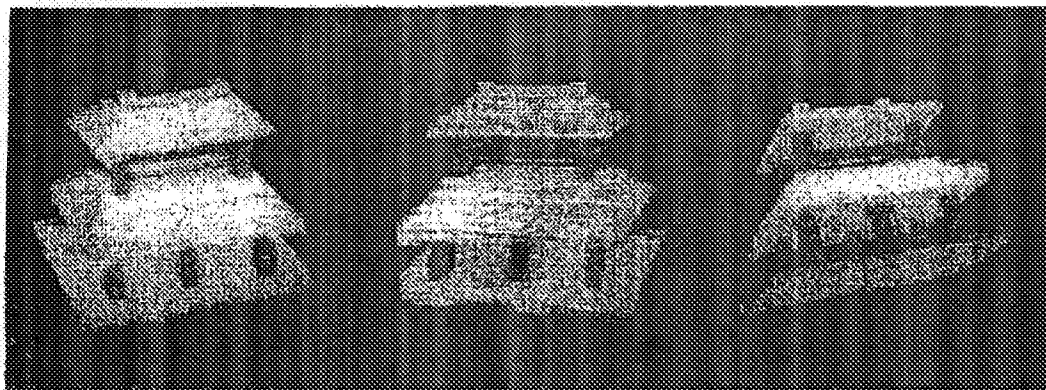
[Drawing 6]



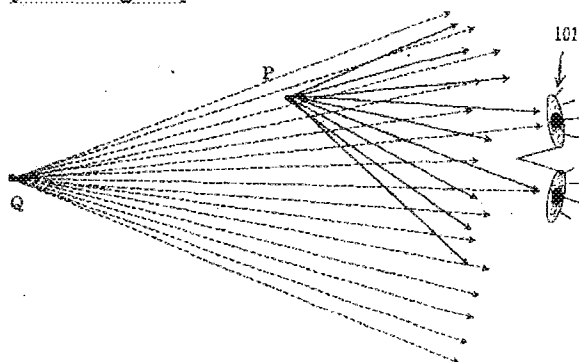
[Drawing 7]



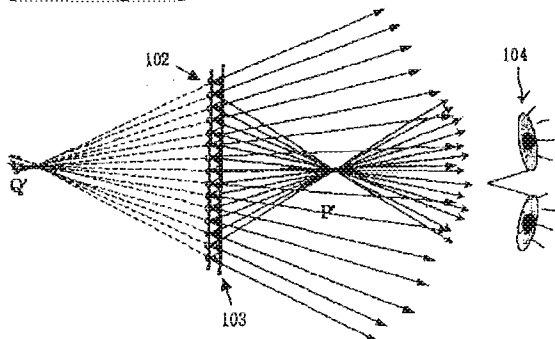
[Drawing 8]



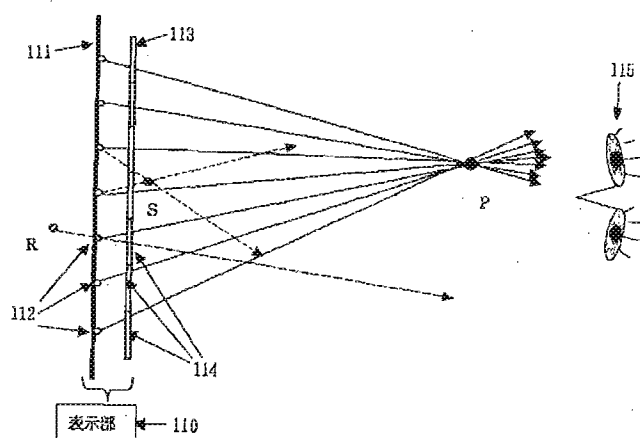
[Drawing 10]



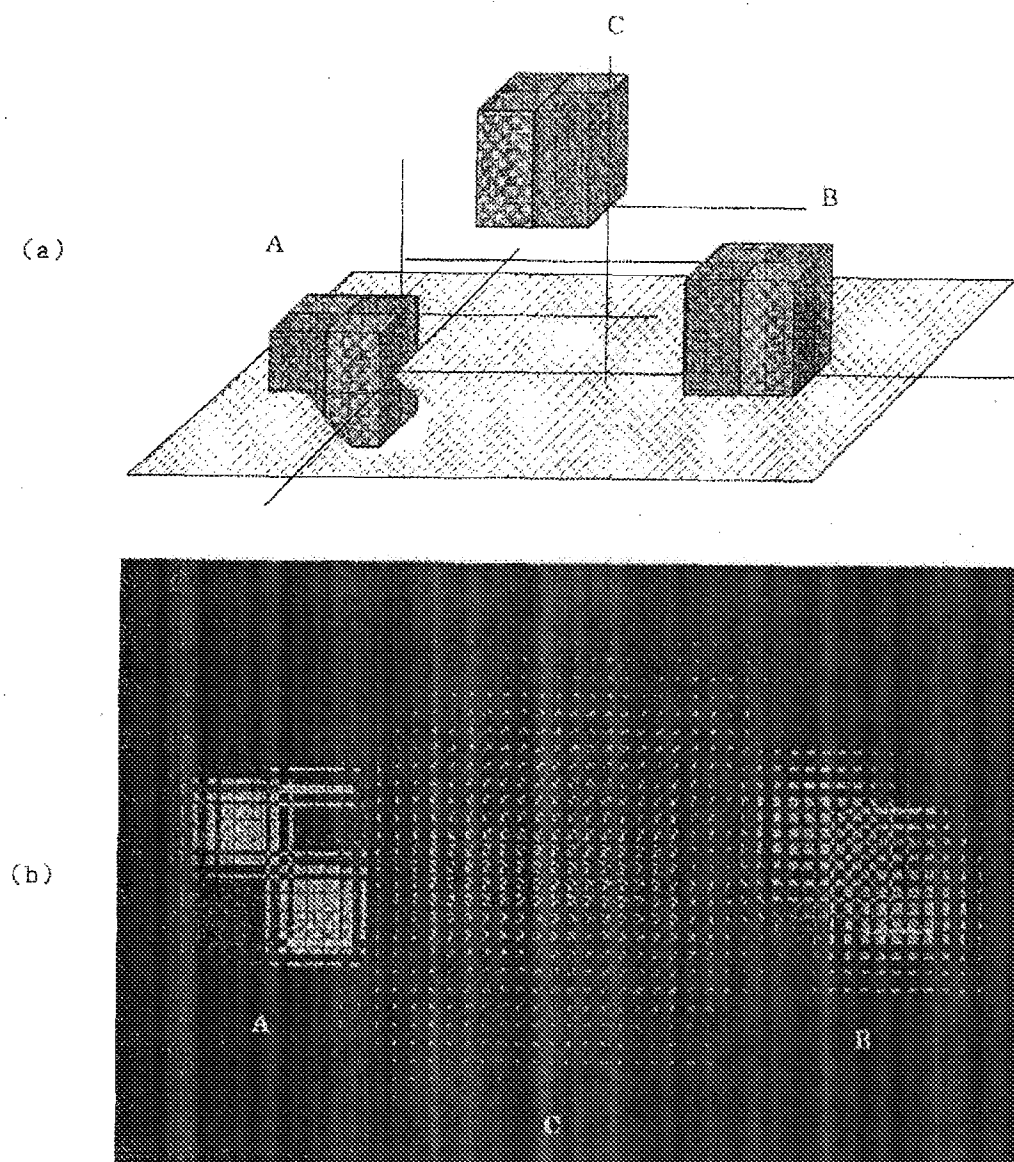
[Drawing 11]



[Drawing 12]



[Drawing 9]





---

[Translation done.]

---

## DETAILED DESCRIPTION

---

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the three-dimensional picture display system combining and [ beam-of-light ] and shadow picture type multi-view parallax.

[0002]

[Description of the Prior Art]There is a method of using two or more pictures not using a holography and coherence using the coherence of light as conventional stereoscopic model record reproduction art. The latter records the object for right eyes, and the planar image for left eyes, the object for right eyes is a right eye at the time of reproduction, and the object for left eyes can be divided roughly into the stereoscope type of 2 eye type devised so that it might be visible by a left eye, and the multi-view-type type using the picture from a multiaspect.

[0003]Although there are a three-dimensional film which uses a polarization eyeglass, stereoscopic television using wrench GYURA, etc. in the stereoscope type example of representation of 2 eye type, Since it cannot say that an image does not change but can be seen even if they change the position to see, since these are not reproducing thoroughly the stereoscopic model of what looks three-dimensional, it can be said to be false stereoscopic model reproduction. [ of the back side ]

[0004]In the holography which is a three-dimensional stereoscopic model record reproduction method (a three-dimensional stereoscopic model is hereafter abbreviated to 3D image) which can be referred to as ideal, in order to record stereoscopic picture information, the wave front data of light are used from the object. He makes the reference beam and the scattered light from an object which were set independently interfere in wave front data, and is trying to record the interference fringe. For this reason, the spatial resolving power of the pitch near a light wavelength is needed for an optical system and a recording medium, and also a coherent light source like laser at least is required for record. Since an interference fringe is dependent on wavelength, a picture in color cannot be dealt with but a device three trichromatic laser being not only required but complicated is required for it as it is for color recording.

[0005]

[Problem(s) to be Solved by the Invention]A full color big screen holography becomes very expensive, and although the others for a credit card or accessories whose scale may be small are used for the recording medium of digital information, they have not come [ as mentioned above, ] to be used for a real time 3D image display, a three-dimensional film, etc. now.

[0006]The thing of a multi-view type is divided into the integral photography which re-projects a stereoscope and looks at it by the reversal process of photography of the multi-view image photoed from the multi-view parallax method only made multi-view and the multiaspect. Since

these are carrying out multiplex reproduction of the picture of a large number from which how for it to be visible by the position to see is different to a stereoscope observing the image from two viewing angles with both eyes, and acquiring a cubic effect from a binocular disparity, how for it to be visible if an eye is moved changes, and glasses have the strong points, like it is unnecessary and is. It has many strong points which are not in a holography -- record reproduction is possible at ordinary light, and reproduction of the scenery of infinite distance can moreover also be performed. However, if a multi-view parallax method and integral photography are carrying out multiplex image formation of whether the image of the total viewing angle is drawn in the fixed field (only one is visible from a natural specific direction) and the focus of the eyes is carried out here, Since it concludes that it is in the position which changed with azimuth difference, a focusing position and the position which is in sight are not in agreement, and unnaturalness must have been escaped (for example, even if an image is visible at hand, the focus of eyes is doubled in the distance). Although a microlens array can perform image record from a multiaspect easily in integral photography, When this is reproduced by a reversal process, the time and effort which looks at the view from the front from a rear face (a face can be seen if the face is reproduced, but a nose can crater and be seen) -- become like and, for this reason, troublesome inside-out operation is needed -- also has a fault, such as many.

[0007]Anyway, under the present circumstances, 3D image recording and reproducing device (system) which is still used fully does not exist, but it looks forward to the appearance. The record reproduction of 3D picture, especially an animation are the most important as picture information media, It is useful in information, broadcast, a movie, entertainment, and a various field, since it has a possibility of being big industry in the future, it is tried regardless of in and outside the country in many companies, the university or the private sector, and the public research institution until now, but the actual condition is that what was still called this is not obtained.

[0008]Then, by projecting the multiaspect image group on a light filter by a white point light source array, the invention-in-this-application person generated artificially the beam group equivalent to the scattered light from an object, and has already proposed the "beam-of-light reclaiming process" which creates 3D image (JP,10-239785,A). Although this is similar to integral photography in that a multiaspect image group is used, it reproduces the 3D image with depth itself, differs in that azimuth difference is not used, and is close to a holography rather (if camera photographing is carried out, it will fade except a focusing part). It has succeeded in 3D image generation it can already be mostly satisfied with an easy object of generation. The greatest problem of this device is that an image is unreproducible near a point light source array or the color filter part (an indicator will be called). As what solves this problem, an invention-in-this-application person, To the picture information near [ this ] the

indicator, reproduction of the three-dimensional image was given up before, azimuth difference was also lost further, and "the stereoscopic model playback equipment with a background" which is altogether brought together in the field of a white point light source array, and is reproduced as a background (or foreground) is proposed (application for patent No. 43742 [ 2000 to ]). However, although the background which does not change even if it changes the angle to see turns to an elutriation signboard, the use is restricted too. It waited for development of the display system from which a stereoscopic model with the still deeper depth to this side is obtained including [ near the display part ] from the back of the indicator with a certain device.

[0009]Hereafter, a Prior art is explained using the principle figure which can carry out a corporal vision.

[0010]In drawing 10, two from which direction and distance differ point P, and Q are used as the observation object object. An objective direction is known in the direction of the beam of light which turns on the watcher 101, and distance is perceived by the parallaxic angle of the both eyes which foresee a point object. Although the beam of light is expressed with the limited line here, there is a beam of light innumerable in practice. If such a beam of light is generable, even if there are not actual two point P and Q, two points should look three-dimensional to the watcher in this way. A beam-of-light reclaiming process generates such a beam of light artificially, and enabled it to observe a stereoscopic model.

[0011]The basic constitution of a beam-of-light reclaiming process is shown in drawing 11. Here, since it is impossible to reproduce a countless beam of light, the method only reproducing the beam of light which passes along the white point light source array 102 distributed over surface state has been taken. If the point type light filter 103 (a liquid crystal panel may be sufficient) which can be penetrated one point of space corresponding to point light source each on the white point light source array 102 and the image filter countered and put on this is arranged, a beam of light with the color which goes to the rectilinear direction to which these two points (the point light source and transmitting point) are connected is renewable. If these beams of light are condensed by one point P' with a lens, it is observed by the watcher 104 and P' looks three-dimensional as the beam of light from P' is coming. An observed image can be formed in the anterior part (the watcher 104 side and a figure for example, P') of an indicator (the white point light source array 102 and the light filter 103), and the rear (with the watcher 104, an opposite hand, and a figure, it is Q') as shown in drawing 11.

[0012]A three-dimensional object is a set of a point, and if the transmission image of the multiaspect instead of a point is recorded on the light filter 103, a three-dimensional object will be reproduced with this composition.

[0013]The greatest problem of this method is that an image is unreproducible around the white

point light source array 102 or a color filter part. However, the point in the field distant from the light filter for beam-of-light reproduction, or the white point light source (it will be called an indicator), That is, in order to pass many beams of light from each point light source at P point of P' of drawing 11, Q', or drawing 12 (after-mentioned), actually he will need to recognize there, as if the watcher had there an object (it is a point object in the case of now), and photography with a camera will also need to unite a focus with these points.

[0014]Drawing 12 is the figure for which the problem of the beam-of-light playback system was shown, and, as for an indicator and 111, each section of the light filter respectively corresponding to said each point light source 112 in 114 corresponding to a light filter in 113 corresponding to each point light source in a white point light source array and 112 and 115 are watchers 110.

[0015]As shown in this figure, there are only 1 or two beams of light from the point light source 112 for reproducing R point and S point in about 110 indicator in total, if there is no much thing, do not reach the watcher 115 and cannot reproduce a three-dimensional image to about 110 indicator with a beam-of-light reclaiming process.

[0016]In order that this invention may solve the above-mentioned problem, in the field distant from the indicator, the conventional beam-of-light reproduction type three-dimensional image display is performed, By creating a light filter so that the picture information in this neighborhood can be expressed as a stereoscopic picture using multi-view parallax although three-dimensional image reproduction is not performed near the indicator with few regenerated light lines, Three-dimensional image reproduction natural in the back of an indicator and the front is realized, and the corporal vision by the azimuth difference of a four-directions multiaspect is realized near the indicator, and both are intermingled in the intermediate area, It aims at providing the three-dimensional picture display system which made the beam-of-light reproduction and shadow picture type multi-view parallax which can observe a three-dimensional stereoscopic picture continuously from the whole region, i.e., the back of an indicator, to this side as a result serve a double purpose.

[0017]

[Means for Solving the Problem]This invention is to achieve the above objects, [1]In a three-dimensional image restoration system combining and [ beam-of-light ] and shadow picture type multi-view parallax, So that a light filter may be arranged to the watcher side of a white point light source array and a beam group of a large number which are equivalent to the scattered light from objective each point so that it may be visible as if an object existed in said watcher there in a field distant from said light filter or the white point light source may be generated, A beam of light from said white point light source is chosen and colored with said light filter, Picture information which reaches an eye via a light filter from said white point light source [ said white point light source which, on the other hand, cannot reproduce the sufficient number

of beams of light and near the light filter ], A beam of light is chosen and colored with said light filter so that parallax type three dimensional display operation depending on a viewing angle may be performed not only to right and left but to the upper and lower sides, this double Tsukuru is intermingled further in both intermediate area, and it is made to be connected continuously.

[0018][2]Above[1]In a three-dimensional picture display system combining and [ of a statement / beam-of-light ], and shadow picture type multi-view parallax, flexibility is given to a way and a filter design which are in sight by arranging two or more [ 1 to ] lenses from said light filter before said watcher.

[0019][3]Above[1]or[2]In a three-dimensional picture display system combining and [ of a statement / beam-of-light ], and shadow picture type multi-view parallax, a lens is inserted between a white point light source array and said light filter, and flexibility is given to a way and a filter design which are in sight.

[0020][4]Above[1]\*\*[2]or[3]In a three-dimensional picture display system combining and [ of a statement / beam-of-light ], and shadow picture type multi-view parallax, it substitutes combining a white light source, a scattered plate, and a pinhole array as said white point light source array.

[0021][5]Above[1]\*\*[2]\*\*[3]or[4]In a three-dimensional picture display system combining and [ of a statement / beam-of-light ], and shadow picture type multi-view parallax, a reproduction three-dimensional picture is animated for said light filter as a spatial modulation panel in which dynamic control is possible.

[0022]

[Embodiment of the Invention]Hereafter, an embodiment of the invention is described in detail.

[0023]Hereafter, the parallax method using the barrier is explained, without [ required for an understanding of this invention ] using glasses.

[0024]Drawing 1 is a figure showing the basic principle of easiest 2 eye type parallax stereogram by the method using parallax.

[0025]In this figure, a watcher (3a is a right eye and 3b is a left eye) and 4 are a picture for right eyes, and a picture for left eyes in 5 the screen with which the picture is drawn 1 or a panel, the barrier which the slit 2a opened 2, and 3.

[0026]So that the object for left eyes and the thing sliced to the length of the picture with the azimuth difference for right eyes may be drawn on the screen or the panel 1 by turns, only the picture 4 for right eyes may be visible to the right eye 3a and the picture 5 for left eyes may be omitted, The barrier 2 which the slit 2a opened to this side is arranged so that right and left may be exchanged also to the left and it may become the same. The position to see is restricted, and there is no up-and-down cubic effect, and there are also many strong points, such as a simple thing and having no glasses. There is also much modification, such as a

method which uses prism and a special screen for a change of the barrier 2. What was extended so that it might change to how for it to be visible when a face is moved is shown in drawing 2. This is a multi-view parallax method.

[0027]In drawing 2, a slit array or a two-dimensional pinhole array, and 13 are watchers the panel in which the picture is drawn 11, a screen, and 12.

[0028]The picture seen from various viewing angles but the object for right eyes and not the object for left eyes is drawn on a panel or the screen 11, in the thing using the slit array 12, the slice drawing seen from the viewing angle on either side is drawn, and an up-and-down cubic effect is not acquired. This is the level polyopia angle version of the parallax stereogram shown in drawing 1. On the other hand, what used the two-dimensional pinhole array instead of the slit array has a vertical and horizontal cubic effect. In this case, one picture comprises a meeting of stippling which shows from a pinhole array and appears, and stereoscopic picture observation from which that picture changes also with the positions to see as well as the picture included in a right eye and a left eye can be performed. But, since depth information has been acquired with azimuth difference, unnaturalness remains in the focusing position of an eye.

[0029]Although it is equivalent to the ability of the picture of the other side of a slit (parallax method of a level chisel), or a pinhole (level and up-and-down parallax method) to be clearly seen, In order for many beams of light with which the directions passing through a slit or a pinhole differ to be separable, a slit and a pinhole cannot be made not much narrowly or small.

[0030]Although not illustrated, since integral photography has arranged the microlens array instead of a pinhole array and the simple version uses the pinhole array instead of the microlens array, It is just the same as that of a pinhole type multi-view parallax method.

[0031]It is also the feature of the conventional multi-view parallax method or integral photography that the physical relationship of the picture currently drawn is upside-down also with the right-and-left upper and lower sides about the image reproduced to the front (four directions are not reversed by the parallax method concerning this invention mentioned later).

[0032]Drawing 3 is a figure showing the basic constitution of the three-dimensional picture display system which made the beam-of-light reproduction and shadow picture type multi-view parallax which show the example of this invention serve a double purpose.

[0033]In this figure, the light filter which 21 has a white point light source array, and 22 has a function of the image filter for beam-of-light generation far away, and has a multi-view parallax method image restoration function in a close-range view, and 23 are watchers.

[0034]The beam of light which came out from the white point light source array 21 is colored with suitable intensity with the light filter 22, and is changed into the beam of light which builds beam-of-light reproduction type 3D image into the portion separated from the indicator. As

opposed to the image reproduction near [ which, on the other hand, cannot pass the beam of light from much point light sources ] the indicator (the white point light source array 21 and the light filter 22 will be called like this collectively), The light filter 22 is constituted so that the color of the virtual body in the exit (watcher side) may be colored to the beam group which passes the virtual body among the beam groups from each white point light source, noting that an object is there. Near the indicator, about the object which spread in 1 pitches or more of the point light source, each point light source serves as a sample point of a picture, and a corporal vision will be carried out as a multi-view parallax picture in the resolution of about 1 pitch of an array.

[0035]In drawing 3, a beam-of-light reclaiming process is used for reproduction of the points P and Q, and the multi-view parallax method is carried out to reproduction of accessories object R' near the indicator. Azimuth difference (parallax) has arisen to the beam of light (thick line) which passes virtual body R' and goes into the watcher's 23 both eyes so that drawing 3 may show. The method of coloring the two light filters 22 for this indicator distant place and neighborhood is not at all different, and changes continuously with the distance of a reappearance object and an indicator.

[0036]Drawing 4 is an example of composition of this invention which substituted the white point light source array using the white light source, the scattered plate, and the pinhole array.

[0037]In this figure, 31 a tabular white light source and 32 a scattered plate and 33 A pinhole array, The image by which the light filter which 34 has a white point light source array, and 35 has a function of the image filter for beam-of-light generation far away, and has a multi-view parallax method image restoration function in a close-range view, and 36 were reproduced by the watcher, and 37 was reproduced by multi-view parallax, the stereoscopic model by which 38 was reproduced by beam-of-light reproduction, and 39 are the reproduced beams of light.

[0038]The composition of drawing 4 resembles the simple version of the integral photography using the pinhole type multi-view parallax method apparently shown by drawing 2, or a pinhole array. Then, the difference is clarified. First, with the composition of drawing 4, from the pinhole array, the panel in which the picture of the multiaspect is drawn is in the watcher side, and is contrary to the composition of drawing 2. Therefore, it is necessary to pass through a pinhole, without the picture information of a multiaspect losing information, and in the composition of drawing 2, the size of a pinhole is not made not much small, as described above. On the other hand, the size may be small as long as the white light of a back light carries out even a passage with the composition of drawing 4 in a pinhole. Thus, both completely differ also in composition and a function.

[0039]Drawing 5 is the example of composition which inserted the lens between the light filter and the watcher, and a reconstruction image when as for 41 a light filter, a liquid crystal panel, and 43 use a lens, 44 uses a watcher and 45 uses a lens a white point light source array and



42, and 46 are the reconstruction images when not using a lens in this figure.

[0040]Thereby, diversity can be given to generation of a stereoscopic model, such as expansion of a stereoscopic model, reduction, a depth position of an observed image, change of a viewing angle which can be observed.

[0041]About the image generation in the field distant from the indicator, since a principle, an effect, and an operation are the same as the beam-of-light reproduction type three-dimensional image display device which conventional technology described by the way and it is the same also as "the stereoscopic model playback equipment with a background" which is the preceded proposal, explanation is omitted.

[0042]Object reproduction nearby is described.

[0043]Drawing 6 is a principle-of-operation figure near [ which shows the example of this invention ] the indicator.

[0044]In this figure, 50 an indicator and 51 a white point light source array and 52 Each white point light source, It is an object which a light filter and 54 reproduce 53 and a watcher, and 56 and 57 want to reproduce each section of a filter, and 55, and it was got blocked and reproduction of the object 56 to which hatching of the slash was applied, and the object 57 painted out by the dot is considered. The beam of light which passes along arbitrary one point R on the object 56 to which hatching was applied can reproduce only only three, and moreover, since many do not go into both eyes, they cannot be seen [ that three-dimensional image reproduction cannot be performed or ] in many cases, either. On the other hand, although it is from the white point light source 52 of a a small number of individual, It is possible to carry out countless generation of the beam of light which comes out of these and passes these two objects 56 and 57, and to make some of them reach both eyes (since the interval of a white point light source array and a light filter section is usually about several millimeters, the object with the size of about several millimeters is assumed). And do in this way, and although it is spatial resolving power about an objective light source interval at the beam of light which reached, Since it adds to objective picture information and azimuth difference (parallax) information is also included, a cubic effect like a beam-of-light reclaiming process will acquire a cubic effect equivalent to the multi-view parallax method which what is obtained and \*\*\*\* is not as for mentions later, and can recognize an object.

[0045]Although the two objects 56 and 57 are separated by the right eye 55a in drawing 6, since it has lapped in the left eye 55b and the directions of the beam of light from each object 56 and 57 also differ, he can understand that parallax exists.

[0046]Drawing 7 is a figure showing the situation of parallax stereoscopic model reproduction near the indicator in this invention.

[0047]In this figure, 60, a white point light source array and 62, a light filter and 64 are beam groups the white point light source and 63, and, as for an indicator and 61, the picture

information seen from this vision is written in the point that the beam group 65 of this direction crosses the light filter 63, as for a watcher and 65. Many directions are also the same.

[0048]The multi-view parallax method here differs in what was described by drawing 2, and composition greatly. That is, the light filter 63 in which the picture corresponding to each viewing angle is drawn is in the watcher 64 side most, it illuminates by the white point light source 62 from the back of that, and it can be said that it differs in that so to speak the shadow picture is seen.

[0049]On the other hand, with the composition of drawing 2, the picture which looks in through a slit or a pinhole and is in the back is seen. Or in integral photography, the image of the pinhole photography which lets the image or pinhole of a slide machine pass via a lens is seen from the opposite hand in the air. Although this difference is the same as the physical relationship of the image currently drawn about the image which is in sight to the front in drawing 7, it is understood also from having reversed four directions with the composition of drawing 2.

[0050]The example of a photograph which photoed with the camera the three-dimensional picture reproduced by this invention from various angles is shown in drawing 8. this side of a building and back one are beam-of-light reproduced images, and the middle of the depth of a building has become parallax reproduction in the light source array position closely [ the ]. When it was a beam-of-light reproduction type three-dimensional image, and placing the frosted glass board etc., the focus suited and was confirmed by the cross section of the picture. Image formation is carried out as image formation was carried out to the position where an image is in sight with the lens.

[0051]Drawing 9 is a figure showing the light filter in which the example of this invention is shown.

[0052]First, the cube (2x2x2) A, B, and C which attached three patterns like drawing 13 (a) as a three-dimensional object to reproduce is arranged, and, as for each, the upper surface is detached only 1, 2, and 5 from the point light source, respectively.

[0053]It is good for the light filter for reproducing this to use drawing 13 (b). The size of one section of a light filter is set to 0.25x0.25. But to the cube A near an indicator, the form of the cube A is left behind by the big pattern over a number section on the light filter. It turns out that browning of the filter is carried out so that it may change with the positions seen about the change of a color. Although the large pattern also remains like the cube A to the cube B which left a few, the pattern of the object B has appeared for every color section. Although the whole cube C from vision which is different for every section about the cube C which fully separated is drawn, the big pattern covering a number section does not appear.

[0054]This shows that a light filter is colored by multi-view parallax about the cube A, and is colored by the beam-of-light playback system about the cube C. About the cube B, they are

these middle.

[0055]This invention is applicable to a wide range of fields, such as imaging technique, broadcast art, art industry, multimedia industry, an advertisement, and a photograph.

[0056]This invention is not limited to the above-mentioned example, and based on the meaning of this invention, various modification is possible for it and it does not eliminate these from the range of this invention.

[0057]

[Effect of the Invention]As mentioned above, as explained in detail, according to this invention, three-dimensional image reproduction natural in the back of an indicator and the front is realized, and the corporal vision by the azimuth difference of a four-directions multiaspect is realized near the indicator, and both are intermingled in the intermediate area, A three-dimensional stereoscopic picture can be continuously observed from the whole region, i.e., the back of an indicator, to this side as a result.

---

[Translation done.]

---

## CLAIMS

---

[Claim(s)]

[Claim 1] So that a light filter may be arranged to the watcher side of a white point light source array and a beam group of a large number which are equivalent to the scattered light from objective each point so that it may be visible as if an object existed in said watcher there in a field distant from said light filter or the white point light source may be generated, A beam of light from said white point light source is chosen and colored with said light filter, Picture information which reaches an eye via said light filter from said white point light source [ said white point light source which, on the other hand, cannot reproduce the sufficient number of beams of light and near the light filter ], With said light filter so that parallax type three dimensional display operation depending on a viewing angle may be performed not only to right and left but to the upper and lower sides Selection of a beam of light, A three-dimensional image restoration system which made beam-of-light reproduction and shadow picture type multi-view parallax which are characterized by coloring, intermingling this double Tsukuru further in both intermediate area, and making it connected continuously serve a double purpose.

[Claim 2] In a three-dimensional picture display system combining and [ according to claim 1 / beam-of-light ] and shadow picture type multi-view parallax, A three-dimensional image restoration system which used beam-of-light reproduction and shadow picture type multi-view parallax giving flexibility also [ filter design / how for it to be visible by arranging two or more / 1 to / lenses from said light filter before said watcher, or ].

[Claim 3] In a three-dimensional picture display system combining and [ according to claim 1 or 2 / beam-of-light ] and shadow picture type multi-view parallax, A three-dimensional image restoration system which inserted a lens between a white point light source array and said light filter, and used beam-of-light reproduction and shadow picture type multi-view parallax giving flexibility also [ filter design / how to be visible or ].

[Claim 4] In a three-dimensional picture display system combining and [ according to claim 1, 2, or 3 / beam-of-light ] and shadow picture type multi-view parallax, A three-dimensional image restoration system which made a white light source, a scattered plate, and beam-of-light reproduction and shadow picture type multi-view parallax substituting combining a pinhole array serve a double purpose as said white point light source array.

[Claim 5] In a three-dimensional picture display system combining and [ according to claim 1, 2, 3, or 4 / beam-of-light ] and shadow picture type multi-view parallax, A three-dimensional image restoration system which made beam-of-light reproduction and shadow picture type multi-view parallax animating a reproduction three-dimensional picture for said light filter as a spatial modulation panel in which dynamic control is possible serve a double purpose.

---

[Translation done.]